

AMENDMENTS TO CLAIMS

1-16. (Canceled)

1 17. (Previously presented): A method of minimizing thermal stress on a gas distribution plate through
2 which gas is dispensed into the interior of a plasma chamber, comprising the steps of:
3 providing a plasma chamber having an interior;
4 mounting an inlet manifold top wall within the chamber;
5 providing one or more inlet manifold side wall segments, wherein each side wall segment
6 includes an upper portion, a lower flange, and a sheet extending between the upper portion of that side
7 wall segment and the lower flange of that side wall segment;
8 mounting the upper portion of each segment of the inlet manifold side wall to the inlet manifold
9 top wall so as to position the segments of the inlet manifold side wall so that they collectively encircle
10 an inlet manifold region within the plasma chamber;
11 providing a gas distribution plate perforated by a number of gas outlet orifices;
12 mounting the lower flange of each side wall segment to the gas distribution plate so that the gas
13 distribution plate is spaced away from the inlet manifold top wall, wherein the inlet manifold top wall,
14 the inlet manifold side wall segments, and the gas distribution plate collectively enclose said inlet
15 manifold region; and
16 supplying a gas through a gas inlet orifice in the inlet manifold top wall so that the gas flows
17 into the inlet manifold region and then flows through the gas outlet orifices into the interior of the
18 plasma chamber.

1 18. (Previously presented): A method according to claim 17, further comprising the step of:
2 maintaining a plasma within the interior of the plasma chamber;
3 wherein the step of providing the inlet manifold side wall segments includes the step of
4 providing each sheet with a thickness sufficiently small, and a height sufficiently large, so as to
5 produce a substantial temperature differential between the inlet manifold top wall and the gas
6 distribution plate in response to heat transferred from the plasma to the gas distribution plate.

1 19. (Previously presented): A method according to claim 17, further comprising the step of:
2 maintaining a plasma within the interior of the plasma chamber;

3 wherein the step of providing the inlet manifold side wall segments includes the step of
4 providing each sheet with a thickness sufficiently small, and a height sufficiently large, so as to
5 produce a temperature differential of at least 100 degrees C between the inlet manifold top wall and the
6 gas distribution plate in response to heat transferred from the plasma to the gas distribution plate.

1 20. (Previously presented): A method according to claim 17, wherein the step of providing the inlet
2 manifold side wall segments includes the step of:

3 providing each sheet with a flexibility sufficient so that no substantial force is required to bend
4 the sheet by an amount sufficient to permit the gas distribution plate to expand by at least one percent.

1 21. (Previously presented): A method according to claim 17, wherein:

2 the inlet manifold top wall has a surface facing the gas distribution plate that is generally
3 rectangular with four sides;

4 the gas distribution plate has a surface facing the top wall that is generally rectangular with four
5 sides;

6 the step of providing the inlet manifold side wall segments comprises providing four of said
7 side wall segments wherein the sheet of each of the four side wall segments is generally rectangular;
8 and

9 the step of mounting the lower flange of each side wall segment comprises mounting each
10 flange so that the sheet of each of the four side wall segments extends between a corresponding one of
11 the four sides of said surface of the top wall and a corresponding one of the four sides of said surface
12 of the gas distribution plate.

1 22. (Previously presented): A method according to claim 17, wherein:

2 the gas distribution plate has one or more grooves in its perimeter; and

3 the step of mounting the lower flange of each side wall segment comprises mounting each such
4 flange so as to extend into one of said grooves.

1 23. (Currently amended): A method according to claim 17, wherein:

2 the gas distribution plate further comprises

3 a lip extending radially outward from the perimeter of the gas distribution plate, and

4 a plurality of pins attached to, and extending downward from, the lip of the gas

5 distribution plate;

6 the lower flange of each side wall segment is perforated by a plurality of holes;

7 the step of mounting the lower flange of each side wall segment comprises mounting each
8 flange to the gas distribution plate so that each of said pins extends through a corresponding one of
9 said holes; and

10 each hole ~~is~~ has a width that exceeds the width of its corresponding pin so as to permit relative
11 movement between each lower flange and the gas distribution plate.

1 24. (Previously presented): A method according to claim 17, wherein:

2 the sheet of each side wall segment is flexible so as to permit movement of the lower flange of
3 that side wall segment in a direction perpendicular to the sheet; and

4 for each side wall segment, each hole in the lower flange of that side wall segment has a long
5 axis parallel to the sheet of that side wall segment.

1 25 (Previously presented): A method according to claim 17, wherein:

2 the width of each hole along one axis of the hole exceeds the width of its corresponding pin
3 along said axis by an amount sufficient to permit an amount of relative movement between each lower
4 flange and the gas distribution plate that exceeds the maximum likely relative differential thermal
5 expansion between the lower flange and the gas distribution plate during operation of the plasma
6 chamber.

1 26. (Previously presented): A method according to claim 17, wherein:

2 the width of each hole along one axis of the hole exceeds the width of its corresponding pin
3 along said axis by at least 0.03 inch.

1 27. (Previously presented): A method according to claim 17, wherein:

2 the width of each hole along one axis of the hole exceeds the width of its corresponding pin
3 along said axis by at least 0.1% of the widest dimension of the gas distribution plate.

1 28. (Previously presented): A method according to claim 17, wherein:

2 said one or more side wall segments include first and second side wall segments; and
3 the method further comprises the steps of:

4 positioning an edge of the sheet of the first side wall segment and an edge of the sheet of the
5 second side wall segment so as to be adjacent, parallel, and separated by a gap; and
6 mounting a post radially outward of the gap and sufficiently close to the gap so as to impede
7 the flow of gas through the gap.

1 29. (Previously presented): A method according to claim 17, wherein:

2 the step of providing one or more side wall segments includes providing first and second side
3 wall segments;

4 the sheet of the first side wall segment is bent at a first angle along a first vertical vertex line so
5 that: (i) a first end area of the sheet extends between the first vertex line and an edge of the sheet, and
6 (ii) a first central area of the sheet lies on the opposite side of the first vertex line;

7 the sheet of the second side wall segment is bent at a second angle along a second vertical
8 vertex line so that: (i) a second end area of the sheet extends between the second vertex line and an
9 edge of the sheet, and (ii) a second central area of the sheet lies on the opposite side of the second
10 vertex line;

11 the method further comprises the step of positioning said edge of the sheet of the first side wall
12 segment and said edge of the sheet of the second side wall segment so as to be adjacent, parallel and
13 separated by a gap; and

14 the first and second angles are established so that the first and second end areas are coplanar
15 and are separated only by said gap.

1 30. (Previously presented): A method according to claim 29, wherein both the first angle and the
2 second angle are 45 degrees.

1 31. (Previously presented): A method according to claim 29, further comprising the step of mounting
2 a post radially outward of the gap, wherein:

3 the post extends vertically along the entire length of the gap;

4 the post extends laterally so as to overlie the first end area, the second end area, a portion of the
5 first central area adjoining the first vertex line, and a portion of the second central area adjoining the
6 second vertex line; and

7 the post is positioned sufficiently close to said portions of the first and second areas, and said
8 portions of the first and second areas are sufficiently large, so that the post impedes gas within the inlet

9 manifold from flowing through the gap.

1 32. (Previously presented): A method of minimizing spatial variation in temperature of a gas
2 distribution plate through which gas is dispensed into the interior of a plasma chamber, comprising the
3 steps of:

4 providing a plasma chamber having an interior;

5 mounting an inlet manifold top wall within the chamber;

6 providing an inlet manifold side wall including one or more side wall segments, wherein each
7 side wall segment includes an upper portion, a lower flange, and a sheet extending between the upper
8 portion of that side wall segment and the lower flange of that side wall segment;

9 mounting the upper portion of each side wall segment to the inlet manifold top wall so as to
10 position the side wall segments so that they collectively encircle an inlet manifold region within the
11 plasma chamber;

12 providing a gas distribution plate perforated by a number of gas outlet orifices;

13 mounting the lower flange of each side wall segment to the gas distribution plate so that the gas
14 distribution plate is spaced away from the top wall, wherein the inlet manifold top wall, the inlet
15 manifold side wall segments, and the gas distribution plate collectively enclose said inlet manifold
16 region; and

17 supplying a gas through a gas inlet orifice in the inlet manifold top wall so that the gas flows
18 into the inlet manifold region and then flows through the gas outlet orifices into the interior of the
19 plasma chamber; and

20 providing a plasma with the chamber;

21 wherein the inlet manifold side wall interposes a sufficiently high thermal resistance between
22 the inlet manifold top wall and the gas distribution plate so that, during operation of the plasma
23 chamber, the gas distribution plate has a spatial variation in temperature no greater than 50 degrees C.

1 33. (Previously presented): A method according to claim 32, wherein said spatial variation in
2 temperature is no greater than 10 degrees C.

1 34. (Previously presented): A method of minimizing the difference in temperature between a
2 workpiece support pedestal and a gas distribution plate through which gas is dispensed into the interior
3 of a plasma chamber, comprising the steps of:

4 supporting a substrate on a pedestal within the plasma chamber;
5 heating the pedestal;
6 mounting an inlet manifold top wall within the chamber;
7 providing an inlet manifold side wall including one or more side wall segments, wherein each
8 side wall segment includes an upper portion, a lower flange, and a sheet extending between the upper
9 portion of that side wall segment and the lower flange of that side wall segment;
10 mounting the upper portion of each side wall segment to the inlet manifold top wall so as to
11 position the side wall segments so that they collectively encircle an inlet manifold region within the
12 plasma chamber;
13 providing a gas distribution plate perforated by a number of gas outlet orifices;
14 mounting the lower flange of each side wall segment to the gas distribution plate so that the gas
15 distribution plate is spaced away from the top wall, wherein the inlet manifold top wall, the inlet
16 manifold side wall segments, and the gas distribution plate collectively enclose said inlet manifold
17 region; and
18 supplying a gas through a gas inlet orifice in the inlet manifold top wall so that the gas flows
19 into the inlet manifold region and then flows through the gas outlet orifices into the interior of the
20 plasma chamber; and
21 providing a plasma within the chamber;
22 wherein the inlet manifold side wall interposes a sufficiently high thermal resistance between
23 the inlet manifold top wall and the gas distribution plate so that, during the steps of heating the pedestal
24 and providing a plasma within the chamber, there is a temperature difference between the pedestal and
25 the upper surface of the substrate no greater than 50 degrees C.

1 35. (Previously presented): A method according to claim 34, wherein said temperature difference is no
2 greater than 25 degrees C.

1 36. (New): A method according to claim 17, wherein the step of providing the inlet manifold side wall
2 segments includes the step of:
3 providing each sheet with a thickness less than 3 millimeters.

1 37. (New): A method according to claim 17, wherein the step of providing the inlet manifold side wall
2 segments includes the step of:

3 providing each sheet with a thickness less than 1 millimeter.

1 38. (New): A method according to claim 17, wherein the step of providing the inlet manifold side wall
2 segments includes the step of:
3 providing each sheet with a flexibility sufficient to permit each sheet to bend at least 6.3
4 degrees.

1 39. (New): A method according to claim 17, further comprising the steps of:
2 positioning a workpiece within the interior of the plasma chamber; and
3 maintaining a plasma within the interior of the plasma chamber;
4 wherein the step of providing the gas distribution plate includes the step of providing the gas
5 distribution plate with a surface facing the workpiece; and
6 wherein the step of providing the inlet manifold side wall segments includes the step of
7 providing each sheet with a flexibility sufficient so as to prevent the flatness of said surface of the gas
8 distribution plate from being distorted by more than 25 microns in response to heat from the plasma.

1 40. (New): A method according to claim 17, further comprising the steps of:
2 positioning a workpiece within the interior of the plasma chamber; and
3 maintaining a plasma within the interior of the plasma chamber;
4 wherein the step of providing the gas distribution plate includes the step of providing the gas
5 distribution plate with a surface facing the workpiece; and
6 wherein the step of providing the inlet manifold side wall segments includes the step of
7 providing each sheet with a flexibility sufficient so as to prevent the flatness of said surface of the gas
8 distribution plate from being distorted by more than 10 microns in response to heat from the plasma.